REMARKS

Claims 23, 27, 31, 34, and 38-39 are amended, and claims 42 and 44-45 are canceled, without prejudice or disclaimer. Claims 23-41, 43, and 46-47 are pending.

The amendments to the specification, abstract, and claims are based on the application as originally filed, so it is respectfully submitted that no new matter has been added.

In the office action, the abstract was objected to. The Abstract has been replaced with a new Abstract having less than 150 words and overcoming the objections, so reconsideration and withdrawal of the objection are respectfully requested.

In the office action, the drawings were objected to for not showing a continuous gap recited in claims 23, 31, and 38. The feature of a continuous gap has been removed from the claims, so reconsideration and withdrawal of the objection to the drawings are respectfully requested.

In the office action, the specification was objected to for not clearly disclosing a continuous gap recited in claims 23, 31, and 38. The feature of a continuous gap has been removed from the claims, so reconsideration and withdrawal of the objection of the specification are respectfully requested.

In the office action, the specification was objected to under 35 U.S.C. § 112, first paragraph, in connection with recitation of "inertial confinement fusion (ICF)". In addition, the use of the term "pycnonuclear" in connection with the term "cold" was also referred to.

The specification has been amended to remove the term "inertial confinement fusion", "ICF", and "cold".

It is respectfully submitted that the invention as otherwise described and claimed is directed to well known technology involving particle accelerators, once referred to as "atom smashers", for generating nuclear transmutation of elements.

In fact, the background of the invention, on page 5, in paragraph of the published application, U.S. Patent Number 3,892,970 to Freeman et al. is mentioned, with such patent disclosing a relativistic electron beam (REB) is used to create an "REB induced thermonuclear microexplosion" (U.S. Patent Number 3,892,970, column 1, lines 50-53).

As to pycnonuclear processes, the applicant submits that such processes are well known and established in the relevant technical field, in that it is necessary to view the applicant's discovery against its background disclosed in the article of K.F. Zelenskii, O.P. Pecherskii and V.A, Tsukerman "Effects of electron impact on the anode of pulsed X-Ray tube" because the examiner supposes that "effect claimed by applicant's were not observed in many experiments with near similar condition of rod-pinch anode irradiation by relativistic electrons".

The Zelenskii article was written in 1966 and published in Russian in Soviet "Journal of Technical Physics", Vol. XXXVIII, No.9, pp. 1581-1586, 1968. The referenced article mentioned by the examiner relates to reissue of the article in English in next 1969 year.

It is obvious that the meanings of word-combinations "near similar condition" and "identical condition" are not equivalent. Moreover, it is obvious also that unobserved outcome of any previous experiments performed on some defined conditions cannot be a basis for impetuous abnegation of substantially new information, which is obtained as a result of many posterior experiments performed on essentially different conditions.

Even the ancients knew that "the Devil is concealed in details", indeed some details are capable of transforming a seeming likeness into an essential difference.

In fact, Zelenskii et al. used a two-electrode pulsed X-Ray tube as a base of experimental assembly for their researches. This tube:

(a) was equipped with condenser percussion circuit having working voltage 3.2 MeV and capacity of 6.4 microfarads, and

(b) was comprised of

a hollow thin-walled all-metal cathode formed as truncated cone, which has pointed edge, and

an all-metal (namely: aluminum, copper, and steel) current-conducting anode that had a rod and an end element formed as a cylindrical body of various diameter and length, or as a sphere of constant diameter 10 mm (i.e. 1 cm).

Said conical cathode was directed to the anode's end element by its smaller base.

Said anode was positioned in respect of said cathode concentrically with broad annular gap in all cases and gone beyond the pointed cathode's edge over a regulated distance "L" (see Fig.1 in said article) usually.

In some cases the "vertex" of the spherical anode was positioned on a level of the pointed cathode's edge, and therefore each such anode as a whole was surrounded (but not embraced) by said cathode.

Electrical characteristics of processes realized by Zelenskii et al were as follows:

pulse current, kA.....10 - 20

pulse duration, microsecond (see respectively Tables 1 and 2 in said article):

no less than 0.4 (i.e. 400 nanoseconds) for cylindrical anodes, and

no less than 0.55 (i.e. 550 nanoseconds) for spherical anodes.

The area of any sphere must be defined as $4\pi r^2$ where "r" is sphere radius. For known spherical anodes "r" was equal 0,5 cm. Subsequently, the area of each of these anodes was equal $(4*3.14*0.25) \approx 3,14$ cm^2. Let us assume that maximum pulse current defined by Zelenskii et al as 20 kA was distributed on said spherical anode area uniformly. Thus, the known current density was about $6.37*10^3$ A/cm^2. It gives rated pressure near centers of the spherical anodes at level 130 kilobar (i.e. 13000 MPa).

As a result of many experiments utilizing above-mentioned assembly on said conditions Zelenskii et al. had stated that

(a) the above-mentioned long percussive action of electrons onto anode surface causes rapid heating and evaporation of the top layer of all cylindrical and spherical anodes;

(b) such rapid evaporation excites shock waves in remaining material of said anodes;

(c) these shock waves calls forth

at least visible deformation of the aluminum spherical anodes (see Fig.5b in said article) and, in a few experiments, occurrence inside aluminum and copper anodes of practically spherical cavities about 5 mm in diameter (see Fig.5c in said article); or

an alteration of material color inside of some steel anodes as an evidence of their partial restructuring (see Fig.6 in said article).

However, Zelenskii et al. did not state any alterations of chemical (in particular, isotopic) composition of any anode material.

Perhaps, this fact caused the burying in oblivion of above-mentioned article almost 40 years.

Accordingly, the applicant respectfully submits that the same long oblivion is a significant evidence of non-obviousness of the applicant's discovery and invention.

Now we consider the applicant's discovery in comparison with officially known for historians of physics but practically lost data obtained by Zelenskii et al.

For purpose of this consideration, keep in mind that FIG.1 and all other original figures included into applicant's application are quite correct and do not require any alterations.

It is clear for any unprejudiced skilled in art person that design and performance capabilities of such applicant's compound plasma cathode are in principle different from design and performance capabilities of Zelenskii's hollow thin-walled all-metal pointed cathode.

The applicant used a relativistic vacuum diode (hereafter RVD) as base of own assembly for compressing any condensed substance to a superdense state. This RVD was equipped with:

the above described axisymmetric compound plasma cathode in the form of rigidly assembled a current-conducting rod and a dielectric end element, emitting area of which exceeds cross-section area of said current-conducting rod,

an axisymmetric anode-enhancer, the maximum cross-section area of which being smaller than the emitting area of the dielectric end element of said cathode, and

a suitable mean for adjusting an axial gap between said electrodes, i.e. the axial space between the point of intersection of the end surface of the dielectric element of the plasma cathode with its symmetry axis and similar point at the end of the anode-enhancer both lying practically along the same geometric axis.

Said anode-enhancer can be either integral or including a target. The maximum cross-section area of the anode-enhancer (and more precisely, of the target) being smaller than the emitting area of the dielectric end element of said cathode.

Said RVD was connected to a suitable pulsed high-voltage power source that allows generating current pulse not greater than 100 ns (and preferably not greater than 50 ns).

It is clear also for any unprejudiced skilled in art person that design and performance capabilities of such proposed by the applicant's pulse RVD is in principle different from design and performance capabilities of used by Zelenskii et al pulse X-Ray tube.

Many experiments intended for research of action of high-energy electron beams onto made from condensed substances targets were performed in "Proton-21" Company Ltd. in association with the applicant under the following conditions:

when the simplest anode-enhancer was made as a whole or in their target parts from highly pure copper, tantalum and other materials,

when the anode-enhancer was placed towards the plasma cathode so that the center of curvature of working surface of said anode-enhancer was located inside the focal space of the collectively self-focusing electron beam; and

when each said anode-enhancer was acting by an electron beam with an electron energy no less than 0.2 MeV, current density no less than 10^6 A/cm^2 and discharge duration not greater than 100 ns (and preferably not greater 50 ns).

It is clear that said conditions are not "near similar" to above described conditions of experiments performed by Zelenskii et al.

In fact, new order of values of current density (no less than 10^6 A/cm^2) is a thousand times greater as known current density (10^3 A/cm^2).

Analogously, new discharge duration (not greater than 100 ns) is more than five times lesser as known discharge duration (no less than 550 ns for spherical anodes).

As a result of these experiments on said conditions, the applicant had been stated that

(a) during each rapid discharge of the pulsed high-voltage power source, the electron beam current (despite a sharp voltage drop on the RVD plasma cathode) only slightly decreases as compared to the peak value (see FIG.7);

(b) after being compressed by impact, a tangible portion of each target mass flew apart and precipitated as aggregates of transmutation products on the walls of the RVD vacuum chamber and/or on the shield mounted in the tail part of said anode-enhancer;

(c) some aggregates were rather homogeneous as for their elemental composition and obtained in quantities sufficient for their chemical studies;

(d) not only stable isotopes of known chemical elements which had not been present in the substance of the targets as admixtures but also relatively stable isotopes of transuranides unknown now and not identified on priority date were certainly detected in the aggregates;

(e) isotopic composition of the products of transmutation of the target substance essentially differed from the reference data on the isotopic composition of the same elements in the Earth's crust.

These changes of chemical (especially, isotopic) composition of target materials are experimentally stated by the application for the first time.

The examiner \rejects this discovery (and invention based thereon) because

(1) Zelenskii et al. allegedly did not discover said changes, and

(2) the applicant has alleged not provided independent confirmation of his discovery.

As regards the first objection of the examiner, the application submits that there is a substantial difference between:

relatively "weak" experimental conditions, which were used by Zelenskii et al in sixties of the 20th century, and

"strong" experimental conditions, which were used by the applicant at the beginning of the 21st century.

DOCUMENTS IN SUPPORT OF THE SCIENCE

To support the applicant's position that such pycnonuclear processes and transmutation of elements are not only possible using the applicant's apparatus but are well known and not experimental, a few listed below attested

copies of many independent physicists' reports and conclusions are directed to pycnonuclear processes and transmutation of elements, and

copies of reports and articles of the applicant and his research assistants.

The term "pycnonuclear processes" was introduced at first in theoretical astrophysics.

In fact, W.A. Wildhack had theoretically stated possibility of pycnonuclear processes in very dense and relatively cold substance already in 1940 [see his article "The proton-deuteron transformation as source of energy in dense stars" published in "Physical Review", Vol.57, 1940, p.81].

Further soviet physicist Ya.B. Zel'dovich had considered the questions about formation and stability of nuclei of chemical elements under action of electrons and high pressure (see Зельдович Я. Б., ЖЭТФ, т. 33, С. 991, 1957; in English - Journal of Experimental and Theoretical Physics, Vol.33, p.991, 1957).

A little later Cameron A.G. explored analogous questions theoretically too (see Astrophysical Journal, V.130, p. 916, 1959).

Characteristic specialties of pycnonuclear processes in superdense media were theoretically investigated by E.E. Salpeter and H.M. van Horn [see their article "Nuclear reactions rates at high densities" published in "Astrophysical Journal", Vol.155 (1969), p.183].

Not long ago, S. Ishimaru and H. Kitamura had also theoretically stated that pycnonuclear processes (in particular, at temperature near absolute zero) may provide for synthesis of new nuclei from any initial substance (see Physics of Plasmas, Vol. 6, No 7, 1999).

However, above-mentioned and other theoretical research studies in astrophysics do not enable one to formulate any explicit instructions in respect of creation and practical use of pycnonuclear technology on the Earth.

Attached hereto are submissions reflecting the known and established science of pycnonuclear processes:

Appendix 1 is a Statement of the International Scientific Workshop (Bonn, Germany, February 6-7, 2004) signed by seven members of International Working Group; this document establishes such data concerning the present invention.

Appendix 2 is "XEPMA analysis of the samples received from Proton 21 laboratory" fulfilled by Department for Applied Physics and Electronics of Umea University (901 87, Umea, Sweden) and signed of October 27, 2004 by PhD Britt Anderson; this document confirms independently, for the most part, the analogous results obtained in Proton 21 immediately.

Appendix 3 is "ToF-SIMS Analysis Particles on a Cu Detection Screen" fulfilled in Germany by Dirk Avau and his research assistants; this document includes detailed illustrated specification of products obtained by the applicant's research team; and

Appendix 4 is "Verification Report on nuclear transformation experiments of Proton 21. Verification measurements in different laboratories in Belgium".

This Appendix 4 is characterized in that the authors of it participated immediately in experiments on research laboratory of the Proton 21 Limited.

At once, said "Verification Report..." confirms adequacy of data about method and device for realization of impact compressing a condensed substance to a superdense state and for transmutation of atomic nuclei of certain chemical elements into nuclei of other chemical elements with following energy liberation.

Furthermore, two Russian-writing documents exist, namely:

Appendix 5 is a Conclusion concerning mass-spectroscopic analysis of isotopic composition of samples No. 7889.1, 7891.1, 7930.1 and 7937.1 presented by Proton 21 to Research Institute of Russian Research-and-Production Corporation "Luch" (i.e. "Beam" in English); this document consists information about atypical ratios of isotopes within said samples in comparison with respective natural ratios;

Appendix 6 is Conclusion concerning thermionic mass-spectroscopic analysis of isotopic composition of samples No. 10475.1, 10475.2, 10472.1, 10472.2, and 10512.2 presented by Proton 21 to aforesaid Institute. This document contains information to both atypical ratios of isotopes and many non-identified extra-heavy nuclei.

Research publications of the applicant include:

Appendix 7 is the report of S.V. Adamenko and A.S. Adamenko "Isotopic composition peculiarities in products of nucleosynthesis in extremely dense matter" [see Proceedings of the International Symposium "New Projects and Lines of Research in Nuclear Physics", Messina, Italy 24-26 October 2002, pp.33-43];

Appendix 8 is the report of S.V. Adamenko and A.A. Shvedov "Superheavy nuclei research" [see op cit Proceedings, pp.355-361];

Appendix 9 is the report of S.V. Adamenko and V.I. Vysotskii "Possible explanation of the anomalous localization effect of the nuclear reaction products stimulated by controlled collapse and the problem of stable superheavy nuclei" [see op cit Proceedings, pp.383-391];

Appendix 10 is the article of S.V. Adamenko and V.I. Vysotskii "Mechanism of Synthesis of Superheavy Nuclei via the Process of Controlled Electron-Nuclear Collapse" [see Foundations of Physics Letters, Vol.17, No.3, pp. 203-233, 2004];

Appendix 11 is the article of S.V. Adamenko and V.I. Vysotskii "Evolution of Annular Self-controlled Electron-Nucleus Collapse in Condensed Targets" [see Foundations of Physics (FoP), Vol.34, n.11, pp. 1801-1831, (Nov 2004)];

Appendix 12 is the article of S.V. Adamenko, A.S. Adamenko, A.A. Gurin and Yu.M. Onishchuk "Track measurements of fast particle streams in pulsed discharge explosive plasma" [see Radiation Measurements Volume 40, Issues 2-6, November 2005, pages 486-489];

Appendix 13 is the article of S.V. Adamenko and V.I. Vysotskii "Neutronization and Protonizaton of Nuclei - Two Possible Ways of the Evolution of Astrophysical Objects and the Laboratory Electron-Nucleus Collapse [see Foundations of Physics Letters (FoPL), Vol.19, n.1, pp. 21-36 (Feb 2006)];

Appendix 14 is the article of S.V. Adamenko, A.S. Adamenko and V.I. Vysotskii "FULL-RANGE NUCLEOSYNTHESIS IN THE LABORATORY. Stable Superheavy Elements: Experimental Results and Theoretical Description" [see Infinite Energy//The Magazine of New Energy Science and Technology, Vol.9, Issue 54, pp.23-30, 2004].

All these documents are necessary and sufficient evidences of non-speculative nature of the present invention.

It is respectfully submitted that such articles are sufficient for overcoming the objection by the examiner to the specification, and so reconsideration and withdrawal of the objection to the specification under 35 U.S.C. § 112, first paragraph are respectfully requested.

In the office action, claim 23 is objected to regarding the word "focusing" . Claim 23 is amended accordingly, reconsideration and withdrawal of the objection to claim 23 are respectfully requested.

In the office action, claims 23, 31, and 38 were rejected under 35 U.S.C. § 112, second paragraph. Claim 23, 31, and 38 are amended to overcome the rejection, so reconsideration and withdrawal of the rejection are respectfully requested.

In the office action, claims 23-41 were rejected under 35 U.S.C. § 102(b) in view of U.S. Patent Number 4,213,073 to Mahaffery; claims 42-45 were rejected under 35 U.S.C. § 103(a) in view of Mahaffery and Bykov et al., "Development of Long-lifetime Cold Cathodes", Technical Physics Letters, v. 25, (11), 71-74, 1999; and claims 46-47 were rejected under 35 U.S.C. § 103(a) in view of Mahaffery and Soviet Patent Number SU 1545826 to Korenev.

Claims 42 and 44-45 are canceled.

The applicants respectfully traverse the rejection based on the cited art.

The Mahaffey's et al U.S. Patent 4,213,073 named "Rod pinch Diode" discloses a device for forming an intense electron beam and propagating the beam.

In the simplest form (see FIG.1 in said patent) this diode comprises of:

(a) a made from electroconductive material (such as carbon) integral discoid cathode having an at least one bore, and

(b) a rod-shaped anode having positioned in sequence –

a relatively thick section,

a medial tapered section, which is positioned within said cathode's bore with broad annular gap and extends, approximately coaxially, through said bore, and

a long needle-shaped section, which gone beyond the cathode's end surface over a distance that is substantially more than cathode's thickness.

Each unprejudiced physicist or engineer can easy ascertain that geometric form, material and arrangement of known Mahaffey's cathode and anode are different substantially from geometric form, material and arrangement of cathode and anode proposed by the applicant.

Analogously, each unprejudiced physicist or engineer can easy understand that any long-lifetime cold cathodes developed by N.M. Bykov et al for generators of high-power microwaves in both centimeter and millimeter wavelength range are unsuitable for equipping of the RVD of the applicant.

In fact, the propagating (i.e. "extending") the electron beam along the anode (see FIGS 4a-4d in the Mahaffey's Patent) "spreads" discharge rate in the anode area and, therefore, does not provide current density no less than 10^6 A/cm^2 in principle. In other words, the rod pinch diode proposed by Mahaffey et al. was meant for solution of problem, which is contrary to problem of compressing of a condensed substance to a superdense state.

Correspondingly, Mahaffey et al. (even together with Bykov et al.) couldn't anticipate the present invention of the applicant.

And, finally, the reference to the Korenev's SU 1545826 is also far fetched as above mentioned Mahaffey's Patent and article of Bykov et al.

In fact, Korenev's "Electron pulse source" (see FIG.1 in said SU 1545826) comprises of:

a vacuum chamber (1) having non-designated aperture as output of electron beam (10) out of said chamber when said source operates,

a profiled thin metal cathode (5) laid on profiled supporting dielectric plate (6) as it is clear shown on FIG.2 in said SU 1545826, and

a thin electroconductive anode (7) that is placed in said dielectric plate (6) in the same plane as the cathode (5) and is "transparent" for generated electron beam.

Said electron pulse source must generate profiled plasma flare (9) on the cathode edge only (but not throughout all surface of cathode's dielectric end element as it was explicitly provided by the applicant).

Accordingly, Korenev's source can be used in uncertain "accelerator technology" and, preferably, in electronic devices for surface treatment of some details.

Thus, it is difficult to understand how Korenev as a whole and its profiled metal cathode may disclose or anticipate the present invention of the applicant even in claim 46 and 47.

In fact, the Mahaffey's and Bykov's cathodes are different from the cathode of the present invention in principle both in respect of destination and in respect of design.

Accordingly, said known cathodes cannot anticipate any features of the cathode of the present invention.

The examiner states that claims 46-47 are unpatentable taking into consideration above mentioned the Korenev's SU 1545826. Once more the applicant states that the Korenev's plasma cathode is different from the plasma cathode of the present invention in principle both in respect of destination and in respect of design despite the fact that each said cathode is composed of electroconductive and dielectric parts.

In fact, the applicant's plasma cathode has dielectric end element as emitter of electrons, whereas profiled dielectric part of Korenev's plasma cathode serves only as support of thin profiled metal element one edge of which serves as emitter of electrons.

Further, Korenev given no instructions concerning preferable ratios of dimensions of metal and dielectric parts of compound plasma cathodes.

Accordingly, the pending claims are patentable over the cited art, so reconsideration and withdrawal of the rejections are respectfully requested.

Entry and approval of the present amendment and allowance of all pending claims are respectfully requested.

In case of any deficiencies in fees by the filing of the present amendment, the Commissioner is hereby authorized to charge such deficiencies in fees to Deposit Account Number 01-0035.

Respectfully submitted,

Date: November 16, 2007

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